Remarks/Arguments:

Claims 1-17 are pending in the above-identified application.

Claim 17 was rejected under 35 U.S.C. § 112, first paragraph as failing to comply with the enablement requirement. This ground for rejection is respectfully traversed. In particular, in the Office Action, it is asserted that "[t]he specification does not clearly describe how the measurement-based dynamic UGPRS unsolicited channel allocation is calculated. Referring to Fig. 9, step 8, it is not sufficiently described how both the increase and decrease constants obtained in steps 6 and 7 are used in calculating the new UGS grant size. It is not clearly described how the UGS average rate is both decreased and increased at the same time in order to calculate a new UGS grant size." Applicants respectfully disagree with this assertion and also note that the Examiner has used the wrong standard for the analysis under 35 U.S.C. § 112, first paragraph.

This rejection appears to be based on a misunderstanding of the drawing that shows steps 6 and 7 as separate steps operating in parallel. The drawing figure has been corrected to show these steps as being performed one after the other. Basis for this amendment may be found in page 13, lines 7-12 of the specification as originally filed. No new matter is added by this amendment.

As set forth in MPEP § 2164.01, quoting *In re Buchner* 929 F.2d 660, 661, 18 USPQ2d 1217, 1223 (Fed. Cir. 1998), "'([t]he test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation.') A patent need not teach, and preferably omits what is well known in the art." This differs significantly from the standard applied by the Examiner that the invention must be "clearly described."

It is noted, however, that the invention defined by claim 17 is clearly described in the specification, as amended, at page 12, line 15 through page 13, line 16. For convenience, this text is presented below.

III. measurement-based dynamic UGPRS unsolicited channel allocation

UGPRS provides high channel utilizations (> 0.95) when the unsolicited allocation is kept within [0.3 - 1.1] times the average bit-rate range. Greater unsolicited allocations lower the UGPRS utilization with the added benefit of decreasing the video frame latency. The question remains: for a given video stream, what should the unsolicited UGPRS allocation be in order to provide high channel utilization and acceptable latency. The present invention provides a simple scheme, which dynamically adjusts the unsolicited allocation based on periodic measurements of the two variables: (1) unsolicited channel allocation and (2) additional amount of traffic granted by the CMTS in response to the piggybacked requests from the CM. These measurements can be performed by the CMTS for each active UGPRS session. Alternatively, to provide for better CMTS scalability, each CM can perform these measurements and notify the CMTS about the new unsolicited allocation (i.e., new value of D) using the unsolicited grant synchronization header element (UGSH) in the extended header.

The proposed method is illustrated in the flow chart of Fig. 9 as follows: The initial unsolicited allocation is set at average bit rate in step 1. Then it is determined if a window time opportunity = (N times the map Intervals (e.g., N=5)) is present in step 2. If so, in step 3, the average number of unused bytes in the unsolicited portion of the UGPRS is measured. At the same time in step 4, the average number of bytes transmitted over the rtPS or "piggyback" requests is determined. In step 5 the average number of unused UGS bytes is compared to a predetermined threshold, to determine if it is greater than the threshold. While one threshold is used for the comparison, generally, any number of threshold comparisons may be performed. For the next window the number of bytes times the rate decrease constant (chosen between 0 and 1) is subtracted from the unsolicited allocation in step 6. At the same time, the average number of bytes transmitted over the piggyback request channel portion times the rate increase constant is added to the unsolicited allocation in step 7. Thus, in step 8, the two constants (increase and decrease) control how fast the unsolicited allocation tracks the changes in the dynamic bandwidth requirements of a video stream. The inventors have determined the rate decrease constant of 0.5 and the rate increase constant of 1.0 provide for an acceptable "dynamic" UGPRS performance.

The subject invention relates to a method for efficiently allocating bandwidth in a network. Using this method, the cable modem termination system (CMTS) periodically sends grants to each cable modem (CM) on the network. When a CM receives a grant, it can send a number of bytes indicated by the grant to the CMTS. There are two types of grants, dynamically allocated and unsolicited. Dynamically allocated grants must be specifically requested by the CM, unsolicited grants are sent by CMTS sends without being asked by any CM. If a CM has more bytes than are allowed by an unsolicited grant then it piggybacks a request for a dynamic grant onto its response to the unsolicited grant. In response, the CMTS issues a dynamically allocated grant to the requesting CM. If all of the data may be transmitted

using unsolicited grants, it is more efficient to use them because to do so reduces traffic on the network; there is no need for any message from the CM to the CMTS requesting a grant. If the unsolicited grant bandwidth is made large, however, then network bandwidth will be wasted by CMs that have little or no data to send. If it is made too small, then the network will be clogged with unnecessary traffic from CMs requesting dynamic grants and there will be a delay corresponding to the time between requesting the dynamic grant and receiving it. Consequently, the network bandwidth is divided between the unsolicited grants and the dynamic grants and the balance between these two types of grants is adjusted for optimum performance. These adjustments, however, are best done incrementally so that the bandwidth allocation does not change dramatically in a short time. This allows the bandwidth to remain substantially unchanged during a short-duration increase or decrease in the used bandwidth but still adjust to a long-term increase or decrease.

As described in this passage, the average number of unused bytes in the unsolicited portion of the UGPRS is measured during a window time opportunity, defined as N map intervals. The MAC map intervals are described at page 5, line 26 through page 6, line 6 and the map data structure is shown in Fig. 2. As described, the map data structure defines how each of the unsolicited grants is to be used. Measuring how these grants are actually used to determine which are unused is well within the skill of the person of ordinary skill in the art of programming network software, especially because the above-cited passage states that "[t]hese measurements can be performed by the CMTS for each active UGPRS session. Alternatively, to provide for better CMTS scalability, each CM can perform these measurements and notify the CMTS about the new unsolicited allocation (i.e., new value of D) using the unsolicited grant synchronization header element (UGSH) in the extended header."

As described above, the algorithm determines 1) the average number of unused bytes in the unsolicited grants and 2) the average number of bytes that were actually transmitted over the rtPS or "Piggyback" requests. The skilled person would recognize that the first measurement corresponds to the "average bandwidth size of an unused portion of the periodically allocated grant" and that the second measurement corresponds to the "average bandwidth size of requested dynamically allocated grants." (See page 8, lines 13-21). Next, the average number of bytes of the unused portion of the periodically allocated grant is compared to a threshold. If it is greater than this threshold, then the size of the periodically allocated grants is too large and needs to be adjusted. As described in the specification, the

system adjusts the size of the unsolicited grants by subtracting a value that is proportional to the size of the unused unsolicited grants and adding a value that is proportional to the size of the dynamic grants. The constants of proportionality, are the rate decrease constant and rate increase constant described in the cited passage. Ignoring these constants, this adjustment is the same as changing the size of the unsolicited grants by the difference between the dynamic grants and the unsolicited grants.

As set forth above, the cited passage describes the invention in sufficient detail to enable the skilled person to make and use the invention. Accordingly, claim 17 is not subject to rejection under 35 U.S.C. § 112, first paragraph.

Claims 1-5 and 8-9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Eng et al. in view of Surazski et al. This ground for rejection is respectfully traversed. In particular, neither Eng et al., Surazski et al. nor their combination discloses or suggests, "determining a bandwidth size for the individually unsolicited periodically allocated grants, the bandwidth size being substantially equal to an average bit-rate of a stream of packets transmitted using the unsolicited periodic grants," or "transmitting a first portion of the data packet in response to the unsolicited periodically allocated grant along with the dynamically allocated grant request," as required by claim 1.

The Eng et al. patent concerns a network access method for both broadband and narrowband networks that uses only dynamically allocated grants. All grants are transmitted by the communications control scheduler in response to an access request or a piggyback request. (See Fig. 5 and column 6, line 37 through column 7, line 41). Eng et al. do not disclose or suggest any "individually unsolicited grants" every packet transmission in the Eng et al. system must be in response to the acceptance of a solicited grant request. Furthermore, because Eng et al. do not disclose or suggest any unsolicited grants, they can not disclose or suggest any step of determining the bandwidth size of unsolicited grants. Instead, Eng et al. determine if there is data left in the buffer after sending a packet in response to a solicited grant request and, if there is, also sending a request for a further grant.

Surazski et al. describe a method for scheduling upstream traffic in a TDMA wireless communication system. The method disclosed by Surazski et al. sends all data by allocating upstream bandwidth to each CPE unit. Indeed, Surazski et al. teach away from using any

dynamically allocated grants as disclosed in the subject invention or using solicited grants as disclosed in Eng et al. (See Surazski et al. column 2, lines 23-33). Accordingly, combining Surazski et al. with Eng et al. would change the principle of operation of Surazski et al. by adding solicited grant requests, which Surazski et al. describe as being "fatal to the operation of a high-rate communications system." (See col. 2, lines 29-33). It is well settled that a combination of this type is improper.

> If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. [1]

For this reason, Applicants assert that these references can not be combined and, thus, that the Examiner has not made a *prima facie* case of obviousness.

Furthermore, even if the combination of Eng et al. and Surazski et al were proper, these references still do not disclose elements of the invention as set forth in claim 1. In particular, neither of these references discloses or suggests "determining a bandwidth size for the stream of data packets [and] ... determining a bandwidth size for the individually unsolicited periodically allocated grants," as required by claim 1. As described above, Eng et al. do not determine any bandwidth size as all data is sent via solicited requests. Because all requests are solicited, there is no need to determine bandwidth because the communications controller/scheduler merely grants requests responsive to total available bandwidth and the priority of the requesting unit. (See column 2, lines 36-47). Surazski et al. does not disclose or suggest any step of determining bandwidth. Instead, Surazski et al. disclose *estimating* bandwidth requirements based on the arrival time of a single packet in a scheduling period. (See column 14, lines 10-19). Thus Surazski et al. do not determine actual bandwidth but, instead, predict future bandwidth needs based on the arrival time of a single packet. Because neither Eng et al. nor Surazski et al. disclose or suggest determining the bandwidth of a stream of data packets or determining the bandwidth size for individually unsolicited periodically allocated grants, the combination of these references can not render claims 1-5 obvious. Furthermore, because Eng et al. teaches that a system using only solicited grants is desirable (see col. 2, lines 37-48) and because Surazski et al. teach that a system using only unsolicited grants is desirable (see col. 2, lines 23-34), the only suggestion to combine these references to form a system, such as the one disclosed in the subject invention that uses a combination of

[1] MPEP §2143.02 quoting *In re Ratti*, 123 USPQ 349 270 F.2d 810 (CCPA 1959)

solicited and unsolicited grants, comes from Applicants own disclosure. It is well settled that using Applicants' disclosure against them in this manner is improper.

> To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure.* (emphasis added)[2]

Accordingly, for the reasons set forth above, claim 1 is not subject to rejection under 35 U.S.C. § 103(a) as being obvious in view of Eng et al. and Surazski et al. Claims 2-5, 8 and 9 depend from claim 1 and are not subject to rejection under 35 U.S.C. § 103(a) as being obvious in view of Eng et al. and Surazski et al for at least the same reasons.

Claims 6 and 7 were rejected under 35 U.S.C. § 103(a) as being obvious in view of Eng et al., Surazski et al. and Lakshman et al. This ground for rejection is traversed for the reasons set forth above. Eng et al. and Surazski et al. are described above. Lakshman et al. describe a method for sending compressed video data streams through the network. Using this method, each video provider estimates an amount of bandwidth it will need for future packets and sends this estimate to the network. The network then analyzes the requests by all of the providers and allocates the available bandwidth in the network among the providers. Each of the providers then adjusts its compression algorithm to fit within the allocated bandwidth. (See column 3, line 45 to column 4, line 2). Like Eng et al. and Surazski et al., Lakshman et al. fail to disclose or suggest any determining of the bandwidth size for a stream of packets or determining of a bandwidth size for individually unsolicited periodically allocated grants, as required by claim 1. Furthermore, because Lakshman et al. does not disclose or suggest dynamically allocated grants, it can not disclose or suggest "transmitting a first portion of the data packet in response to the unsolicited periodically allocated grant along with the dynamically allocated grant request." As required by claim 1. Furthermore, Eng et al. teaches away from any combination with Lakshman et al. because Eng et al. teaches that dynamically allocated grants are preferred over unsolicited grants. Accordingly, claim 1 is not subject to rejection under 35 U.S.C. § 103(a) in view of Eng et al., Surazski et al., and Lakshman et al.

[2] MPEP §706.02(j)

Thus, claims 6 and 7, which depend from claim 1, are also not subject to rejection under 35 U.S.C. § 103(a) in view of Eng et al., Surazski et al., and Lakshman et al.

Applicants appreciate the indication in the Office Action that claims 10-16 are allowed. Applicants have considered the prior art that was made of record but not applied but it does not affect the patentability of any claim.

In view of the foregoing amendments and remarks, Applicants request that the Examiner reconsider and withdraw the rejections of claims 1-9 and 17.

Respectfully submitted,

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